TOP SECRET

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T O P S E C R E T 2821407 FEB 68 CITE [redacted] 3133 25X1

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1. IN RESPONSE TO REFERENCE, [redacted] HAS COMPLETED THE FIRST PHASE OF ITS BI-COLOR EVALUATION. THIS CONSTITUTES A DETERMINATION OF DEGRADATION TO THE PHOTOGRAPHY EXPOSED IN THE BI-COLOR MODE COMPARED TO THAT OF THE NORMAL MODE OF OPERATION. THE PROCEDURE AND RESULTS FOLLOW:

A. SUBJECTIVE COMPARISON OF WRATTEN NUMBERS 25, 21, AND SFO-5 RECORDS:

(1) PHOTO-SCIENCE EVALUATION: TO ESTABLISH A BASIS FOR THE BI-SPECTRAL IMAGE EVALUATION, THE MISSION MATERIAL EXPOSED THROUGH THE PRIMARY FILTERS WAS ANALYZED. THE MATERIAL SELECTED FOR ANALYSIS HAD ESSENTIALLY THE SAME ACQUISITION PARAMETERS AS THE BI-SPECTRAL MATERIAL. DIFFERENCES IN DENSITY, CONTRAST AND IMAGE QUALITY ARE NEGLIGIBLE. THE PHOTO-INTERPRETATION REPORTS INDICATE SIMILAR QUALITY RATINGS FOR BOTH RECORDS. ASSUMING NO CAMERA MALFUNCTIONS, SUBJECTIVE AND OBJECTIVE RESULTS BASED ON THIS EVALUATION INDICATE THAT ANY DIFFERENCE IN THE SFO-5 RECORD AS COMPARED TO THE WRATTEN 21 AND WRATTEN 25 RECORDS IS THE RESULT OF THE

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FILTER. THE OBJECTIVE EVIDENCE IS CONTAINED IN PART B OF THIS REPORT.

THE SFO-5 RECORD AND CONJUGATE IMAGERY FROM THE WRATTEN 25 RECORD WERE VISUALLY COMPARED. A COMPRESSION OF DENSITY EXTREMES IS READILY APPARENT IN THE GREEN FILTER RECORD. DUE TO THIS COMPRESSION, LOW CONTRAST AREAS SHOW A DECIDED INCREASE IN INFORMATION CONTENT ON THE WRATTEN 25 MATERIAL. WHILE IN SOME INSTANCES, THERE IS MORE APPARENT DETAIL IN THE SHADOWS ON THE POSITIVES MADE FROM THE SFO-5 RECORD, THIS DIFFERENCE IS ATTRIBUTED TO THE PRINT DENSITY DICTATED BY COMPROMISE OF THE D-MAX AND D-MIN

THE IMAGE QUALITY OF THE WRATTEN 25 RECORD IS SUPERIOR TO THE SFO-5 FOR INFORMATION CONTENT. OBJECTS THAT APPROACH THE RESOLUTION CAPABILITY OF THE SYSTEM APPEAR MUCH SHARPER. APPARENT EDGE SHARPNESS OF OBJECTS VIEWED AT LOW MAGNIFICATION IS GENERALLY COMPARABLE; HOWEVER, THE WRATTEN 25 RECORD RETAINS THIS APPARENT SHARPNESS MUCH LONGER AS MAGNIFICATION IS INCREASED.

(2) PI REPORT: THE PHOTO-INTERPRETERS PREFERRED THE WRATTEN 25 RECORD OVER THE SFO-5. HIGHER CONTRAST AND OVERALL SHARPER IMAGERY WERE THE TWO MAJOR REASONS FOR THIS PREFERENCE. THEY ALSO EXPRESSED THE OPINION THAT WHEN SHADOW DETAIL IS NEEDED

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A LIGHTER PRINT FROM THE WRATTEN 25 RECORD WOULD BE MORE DESIREABLE THAN THE LOWER CONTRAST OF THE SFO-5 MATERIAL, WHICH SEEMS TO PROVIDE MORE SHADOW DETAIL ON A NORMAL PRINT. SMALL OBJECTS PRESENT IN THE WRATTEN 25 RECORD CAN BE DETECTED IN THE SFO-5 RECORD; HOWEVER, IDENTIFICATION OF THESE OBJECTS IS MUCH MORE DIFFICULT. THE GENERAL CONCLUSION OF THE PHOTO-INTERPRETERS IS THAT THE MAJORITY OF THE REQUIREMENTS LEVEIED FOR THE KH-4B

GROUP 1
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SYSTEM COULD BE ANSWERED WITH PHOTOGRAPHY GENERATED IN THE BI-COLOR MODE BECAUSE WHEN USED IN STEREO, THE TWO RECORDS COMPLEMENT EACH OTHER. IN ADDITION, THE OVER-ALL INFORMATION CONTENT OF THE PHOTOGRAPHY EXPOSED THROUGH THE GREEN FILTER IS COMPARABLE TO AN AVERAGE KH-4A MISSION.

B. OBJECTIVE ANALYSIS

(1) MICRO-D TRACES: TO SUBSTANTIATE THE RESULTS OF THE SUBJECTIVE ANALYSIS, MICRODENSITOMETRIC TRACES OF 11 TARGETS WERE GENERATED. SIX TARGETS WERE SELECTED FROM THE NON BI-COLOR PORTION OF THE MISSION AND FIVE TARGETS WERE CHOSEN FROM THE BI-COLOR PORTION. EACH TARGET WAS COVERED STEREOSCOPICALLY AND THE NEGATIVE RECORD OF EACH TARGET WAS TRACED. THE TRACES WERE GENERATED BY THE MANN MICRODENSITOMETER WITH AN EFFECTIVE

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SPLIT APARTURE OF 10 MICRONS. VISUAL COMPARISONS OF THE TRACES FROM THE NON BI-COLOR MATERIAL INDICATE THE SIMILARITY THAT EXISTS BETWEEN THE WRATTEN 25 AND 21 RECORDS. HOWEVER, COMPARISONS OF THE TRACES FROM THE BI-COLOR MATERIAL INDICATE THAT A SUBSTANTIAL DIFFERENCE IN DENSITY AND CONTRAST EXIST BETWEEN THE WRATTEN 25 AND SFO-5 MATERIALS.

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THE MINIMUM DENSITY, MAXIMUM DENSITY, AND THE DENSITY RANGE OF EACH TARGET HAS BEEN DERIVED FROM THE TRACES AND IS TABULATED BELOW. THE SIMILARITY OF THE WRATTEN 25 AND 21 RECORDS, AND THE NON-SIMILARITY OF THE WRATTEN 25 AND SFO-5 RECORDS IS EVIDENCED BY THE VALUES IN THE TABLE.

FIGURE	PASS	FRAME	FILTER	D-MIN	D-MAX	DELTA
1	D16	6 FWD	25	0.72	2.37	1.65
2	D16	12 AFT	21	0.70	2.48	1.78
3	D16	12 FWD	25	0.75	1.64	0.89
4	D16	18 AFT	21	0.78	1.78	1.00
5	D16	13 FWD	25	0.65	1.60	0.95
6	D16	20 AFT	21	0.92	1.85	0.93
7	D79	7 FWD	25	0.45	1.15	0.73
8	D79	13 AFT	SFO-5	0.58	0.93	0.35

 25X1

9	D79	7 FWD	25	0.35	0.98	0.63
10	D79	13 AFT	SFO-5	0.42	0.72	0.30
11	D97	12 FWD	25	0.62	1.27	0.65
12	D97	19 AFT	SFO-5	1.00	1.32	0.32
13	D97	38 FWD	25	0.36	1.13	0.77
14	D97	44 AFT	SFO-5	0.40	0.88	0.48
15	D129	4 FWD	25	0.80	2.47	1.67
16	D129	10 AFT	21	0.75	2.47	1.72
17	D129	27 FWD	25	0.70	1.65	0.95
18	D129	33 AFT	21	0.75	1.77	1.02
19	D129	32 FWD	25	0.95	1.57	0.62
20	D129	39 AFT	21	1.20	1.92	0.72
21	D154	4 FWD	25	0.84	1.92	1.08
22	D154	10 AFT	SFO-5	0.75	1.44	0.69

(2) RESOLUTION TARGETS: FOUR RESOLUTION TARGETS WERE PHOTOGRAPHED DURING THE NON BI-SPECTRAL PORTION OF THE MISSION. SEVEN TARGETS WERE PHOTOGRAPHED DURING THE BI-SPECTRAL PORTION; HOWEVER,

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DUE TO WEATHER CONDITIONS AND/OR FORMAT LOCATION, ONLY ONE OF THE TARGETS IMAGED IN THE BI-COLOR MODE IS SUITABLE FOR THIS EVALUATION. THE AVERAGE GROUND RESOLUTION OF THESE TARGETS AS DETERMINED FROM

 25X1

THE ORIGINAL NEGATIVE IS PRESENTED BELOW:

CAMERA	PASS	[redacted]	FILTER	25X1
FWD	16D		25	
AFT	16D		21	
FWD	16D		25	
AFT	16D		21	
FWD	32D		25	
AFT	32D		21	
FWD	129D		25	
AFT	129D		21	
FWD	48D		25	
AFT	48D		SFO-5	

AS CAN BE DETERMINED FROM THE ABOVE LIST, THE NON BI-SPECTRAL PASSES (16D, 32D, AND 129D) INDICATE VERY LITTLE RESOLUTION DIFFERENCES BETWEEN THE FWD AND AFT CAMERA RECORDS; HOWEVER, THE BI-SPECTRAL MATERIAL (PASS 48D) SHOWS A DIFFERENCE OF [redacted] 25X1 SCAN DIRECTION BETWEEN THE FORWARD AND AFT CAMERA RECORDS. THIS DIFFERENCE, ALTHOUGH SUBSTANTIAL, REPRESENTS ONLY ONE

 25X1

BAR GROUP. ALSO, IT SHOULD BE NOTED THAT THE [redacted] 25X1 [redacted] READINGS ARE COMPARABLE TO A NORMAL KH-4A MISSION. 25X1

C. SUMMARY AND CONCLUSIONS:

(1) THE CONTRAST RANGE IS SIGNIFICANTLY REDUCED WHEN THE SFO-5 IS USED IN PLACE OF THE WRATTEN 21 OR THE WRATTEN 25.

(2) APPARENT IMAGE SHARPNESS IS REDUCED BY A NOTICABLE DEGREE ON THE SFO-5 PHOTOGRAPHY COMPARED TO THE WRATTEN 21 AND WRATTEN 25.

(3) THE ONLY SUITABLE RESOLUTION TARGET DISPLAY IMAGED DURING THE BI-COLOR ACQUISITION INDICATES A SIGNIFICANT DIFFERENCE IN GROUND RESOLUTION BETWEEN THE SFO-5 PHOTOGRAPHY COMPARED TO THAT OF THE WRATTEN 25.

(4) THE EFFECT OF IMAGE QUALITY DEGRADATION CAUSED BY THE USE OF THE SFO-5 FILTER IS MINIMIZED WHEN THE PHOTOGRAPHY IS VIEWED IN STEREO WITH THE HIGHER QUALITY, HIGHER RESOLUTION PHOTOGRAPHY EXPOSED THROUGH THE WRATTEN 25.

(5) THE RESOLUTION OF THE GREEN FILTERED RECORD IS GENERALLY COMPARABLE TO THAT OF A NORMAL KH-4A MISSION.

END OF MESSAGE